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A new species of saxicolous *Lepidophyma* (Squamata, Xantusiidae) from Tamaulipas, Mexico

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Abstract

We describe a new saxicolous species of *Lepidophyma* from the Sierra Madre Oriental, in the state of Tamaulipas, Mexico and provide morphological and molecular data to support the novelty of this species. The new species is most closely related to members of the *L. sylvaticum* group; however; it is a flattened form specialised for a saxicolous lifestyle and it can be distinguished from all other members by a combination of meristic characters. Genetic analysis suggests that several populations of *L. sylvaticum* might represent additional novel taxa, while the validity of *L. micropholis* is questioned. We discuss conservation priorities of the new species.

Resumen

Describimos una nueva especie saxícola de *Lepidophyma* de la Sierra Madre Oriental, en el estado de Tamaulipas, México, y proporcionamos datos morfológicos y moleculares para apoyar la validez de esta especie. La nueva especie está más estrechamente relacionada con los miembros del grupo *L. sylvaticum*, sin embargo es de un morfotipo aplanado especializado para una vida saxícola y se puede distinguir de todos los demás miembros por una combinación de caracteres merísticos. Los análisis genéticos sugieren que varias poblaciones de *L. sylvaticum* podrían representar nuevos taxones adicionales, mientras que se cuestiona la validez de *L. micropholis*. Se discuten las prioridades de conservación de la nueva especie.

Kurzfassung

Wir beschreiben eine neue Felsen bewohnende Art von *Lepidophyma* aus der Sierra Madre Oriental im Bundesstaat Tamaulipas (Mexiko) und legen morphologische und molekulare Daten vor, die die Hypothese, dass es sich um eine neue Art handelt, unterstützen. Die neue Art ist am nächsten mit der *L. sylvaticum*-Gruppe verwandt, hat jedoch eine abgeflachte Morphologie, die zeigt, dass sie auf Felsen spezialisiert ist. Sie lässt sich durch einer Kombination meristischer Merkmale von allen anderen Mitgliedern der Gattung unterscheiden. Genetische Analysen deuten an, dass mehrere Populationen von *L. sylvaticum* weitere neue Arten darstellen könnten, während die Gültigkeit von *L. micropholis* in Frage gestellt wird. Wir empfehlen Prioritäten für den Schutz der neuen Art.

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PENSOFT

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conservation, night lizards, reptiles, Sierra Madre Oriental, systematics, taxonomy

Palabras Clave
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Schlüsselwörter
Nachteidechsen, Naturschutz, Reptilien, Sierra Madre Oriental, Systematik, Taxonomie

Introduction

The lizard genus *Lepidophyma* (Xantusiidae) ranges from Colima on the Pacific coast and Nuevo León and Tamaulipas on the Atlantic, south along both versants to Costa Rica and Panama, but is mostly absent from the Yucatan Peninsula (Bezy and Camarillo 2002). Predominately a lowland genus, some species range into the mountains to elevations of at least 2100 m a.s.l. Members of *Lepidophyma* are generally restricted to mesic habitats, although several species (e.g. *L. cuicateca*, *L. gaigeae*, *L. occulor*, *L. radula*) have been found in semi-arid interior valleys which are covered by low growing tropical deciduous forest and semi-desert (Bezy and Camarillo 2002; Canseco-Márquez et al. 2008).

The taxonomy and systematics of *Lepidophyma* has received extensive attention for many decades (Smith 1973; Bezy 1973, 1984, 1989; Bezy et al. 1982; Bezy and Camarillo 1992, 1999, 2002). Despite this commendable effort, it appears that the diversity in the genus remains underestimated and new species continue to be discovered. Currently, 22 species are recognised as valid, of which five were described in the last two decades (Canseco-Márquez et al. 2008; García-Vázquez et al. 2010; Palacios-Aguilar et al. 2018; Arenas-Moreno et al. 2021; Lara-Tufiño and Montes de Oca 2021). Molecular analyses have shown that additional taxa might need to be recognised (Noonan et al. 2013).

Here, we describe a new species from the Sierra Madre Oriental of Tamaulipas, based on molecular and morphological evidence and compare it to closely related forms related to the widespread *Lepidophyma sylvaticum*.

Materials and methods

Taxonomic sampling

Between 2009 and 2020, we collected multiple specimens of night lizards of the genus *Lepidophyma* from the Sierra Madre Oriental of eastern Mexico. We photographed all live lizards, including dorsal, lateral and ventral profiles and euthanised them with pentobarbital. We took tissue samples from muscle or liver upon death and preserved them in 96% ethanol. We fixed specimens in 10% formalin and transferred them to 70% ethanol for permanent storage.

The material collected was deposited at the Instituto de Investigaciones sobre los Recursos Naturales (**INIRENA**) of the Universidad Michoacana de San Nicolás de Hidalgo (**UMSNH**) in Morelia, Mexico; and the Museo de Zoología, Facultad de Ciencias (**MZFC**) of the Universidad Nacional Autónoma de México (**UNAM**) in Mexico City. Although we formally accessioned the specimens we collected, several specimens examined from both the MZFC and Herpetology Collection, University of Texas at Arlington (**UTA**) collections have not been catalogued, in which case we list the original field numbers and the respective museum in which they were deposited. Original field number abbreviations are as follows: **CIG** (Christoph I. Grünwald); **JAC** (Jonathan A. Campbell), **JRV** (Jacobo Reyes-Velasco) and **RLB** (Robert. L. Bezy). Museum acronyms throughout follow Sabaj (2020). Specimen numbers for all material examined are provided in Appendix 1. We were not able to measure type specimens of some previously described taxa, so we used the measurements of the type specimens provided in the original descriptions and other published literature (Bezy 1984, 1989; Bezy and Camarillo 2002).

Specimens examined and used for scale counts and comparison of character states are listed in Appendix 1. Distribution maps were generated, based on the GBIF database (www.gbif.org), which includes both museum records as well as distribution records from the Inaturalist platform (inaturalist.org). Additional localities mapped were taken from taxonomic works (Bezy 1984, 1989; Bezy and Camarillo 1992, 1999, 2002) and recent state lists for Nuevo León (Lemos-Espinal et al. 2018), Querétaro (Dixon and Lemos-Espinal 2010), San Luis Potosí (Lemos-Espinal and Dixon 2013) and Hidalgo (Ramírez-Bautista 2014). Additionally, we mapped all localities of the specimens collected by us.

Measurements and character states

Our measurements and character states follow Savage (1963) for all Xantusiidae and Bezy and Camarillo (2002) for *Lepidophyma*. Measurements and character states were taken from data published in Bezy's succession of work on Mexican *Lepidophyma* (Bezy 1973, 1984, 1989; Bezy et al. 1982; Bezy and Camarillo 1992, 1999, 2002). Numbers taken from Bezy (1984) for *L. sylvaticum* were

taken for the "Wet Environs" populations only, as these populations include the type locality of *L. sylvaticum*. We do not consider the "Arid Environs *L. sylvaticum*" (*sensu* Bezy 1984) to be *L. sylvaticum* sensu stricto. These populations appear to be a composite of different taxa (see results below). Additional comparisons between species were enhanced with data from Bezy and Camarillo (2002), Canseco-Márquez et al. (2008), García-Vázquez et al. (2010), Arenas-Moreno et al. (2021) and Lara-Tufiño and Montes de Oca (2021).

Abbreviations used in the text and tables were adopted from Bezy and Camarillo (2002) and are as follows: snout-vent length (**SVL**), tail length (**TL**), total length (**TotL**), head length (**HL**), head width (**HW**), head height (**HH**), orbit diameter (**ED**), fourth toe length (**4TL**), total femoral pores (**FPT**), lateral tubercle rows (**LTR**), gulars (**GUL**), dorsal scales along the mid-dorsal line between the post-parietals and a point above the vent (**DOR**), fourth toe lamellae (**FTL**) and paravertebral row (**PVR**).

Scale counts were performed with the aid of a dissecting microscope. Measurements were taken with a ruler or digital calipers (General, USA) under a dissecting microscope. Bilateral characters were scored on both left and right sides and given in that order, separated by a slash (/). Head length was measured from the tip of the snout to the posterior end of the occipitals, head width was measured at the widest point of the head at the posterior part of the jaw, while head depth was measured at the highest point of the head, at the level of the orbit. All scale dimensions were measured at their maximum.

We have included a high resolution PDF of photographs of the head scalation of the new species, as well as several related forms for comparison, as Suppl. material 1: plate S1.

DNA extraction, amplification and molecular analysis

We sequenced genetic data from two nuclear (C-mos, Rag-1) and three mitochondrial loci (16s, cytb, ND4), using the primers listed in Noonan et al (2013). These loci were shown to be informative for estimating evolutionary relationships in the family Xantusiidae (Noonan et al. 2013). We extracted DNA from tissue samples stored in 96% ethanol with the use of standard potassium acetate protocol (Sokolov et al 1989) and performed Polymerase Chain Reaction (PCR) in total volumes of 48 µl (+ 2 µl of DNA) with the use of regular Taq (Invitrogen), under the conditions specified in Noonan et al. (2013) and references therein. We shipped the unpurified PCR products for sequencing at BGI Tech Solutions (Hong Kong).

We manually trimmed and edited the raw chromatograms using the programme Geneious v. 9.1.6 (Biomatters Ltd., Auckland, NZ). We included additional sequences of members of the family Xantusidae obtained from GenBank in order to infer the phylogenetic relationships of the new samples. We deposited all new sequences in GenBank (Suppl. material 2: table S1). Each locus was individually aligned in MAFFT version 7 (Katoh et al. 2017), with the Q-INS-I option and we concatenated all sequences in FASconCAT v.1.04 (Kück and Longo 2014). We included an additional five nuclear loci used by Noonan et al. (2013); however, we did not sequence these loci for our new taxa. The final alignment consisted of 6819 base pairs and included 66 individuals of the family Xantusidae: 60 individuals of *Lepidophyma*, five individuals of *Xantusia*, as well as one individual of *Cricosaura typica* (Suppl. material 2: table S1). We then performed Maximum Likelihood analysis of the concatenated dataset in IQ-Tree (Nguyen et al. 2015) using the IQ-Tree web server (Trifinopoulos et al. 2016), with an Auto substitution model and 1,000 bootstrap replicates to assess support. Additional analyses were carried out including only nuclear and only mitochondrial loci and they show very similar topology and, thus, they are not included here. We have included all sequences used in this study in a table which is included as Suppl. material 2: table S1.

Results

Molecular phylogenetic results

The phylogenetic relationships of *Lepidophyma*, based on our Maximum Likelihood analysis are, in general, similar to those of Noonan et al. (2013), which is not surprising, as the majority of sequences are shared between the two studies; thus, the general evolutionary relationships of the group will not be addressed here. The sequences of the new species from the vicinity of Jaumave (Tamaulipas) are nested within a group of species consisting of *Lepidophyma occulor*, *L. sylvaticum* and *L. micropholis* (Fig. 1). Our new species appears to be most closely related to an individual of *Lepidophyma* from San Roque, Nuevo León. These two taxa are sister to *L. sylvaticum* + *L. micropholis*, with strong support (bootstrap value = 100). In fact, *L. micropholis* appears to be nested within *L. sylvaticum*, while *L. sylvaticum* might in fact represent several taxa, something that had previously been shown by Noonan et al. (2013).

Systematic account

Lepidophyma jasonjonesi sp. nov.

https://zoobank.org/7389A805-0166-4D07-9D18-02372E324B4E

Figs 2, 3

Proposed standard English name: Jones' Night Lizard

Proposed standard Spanish name: Lagartija Nocturna de Jones

Type material. ***Holotype*** (Fig. 2). INIRENA 2817 (Original field number CIG-0969). Adult male collected in a rock crevice near a small seep, 28 km NNE of Jaumave, on Federal Highway 101 to Ciudad Victoria, Municipio de Victoria, Tamaulipas, Mexico

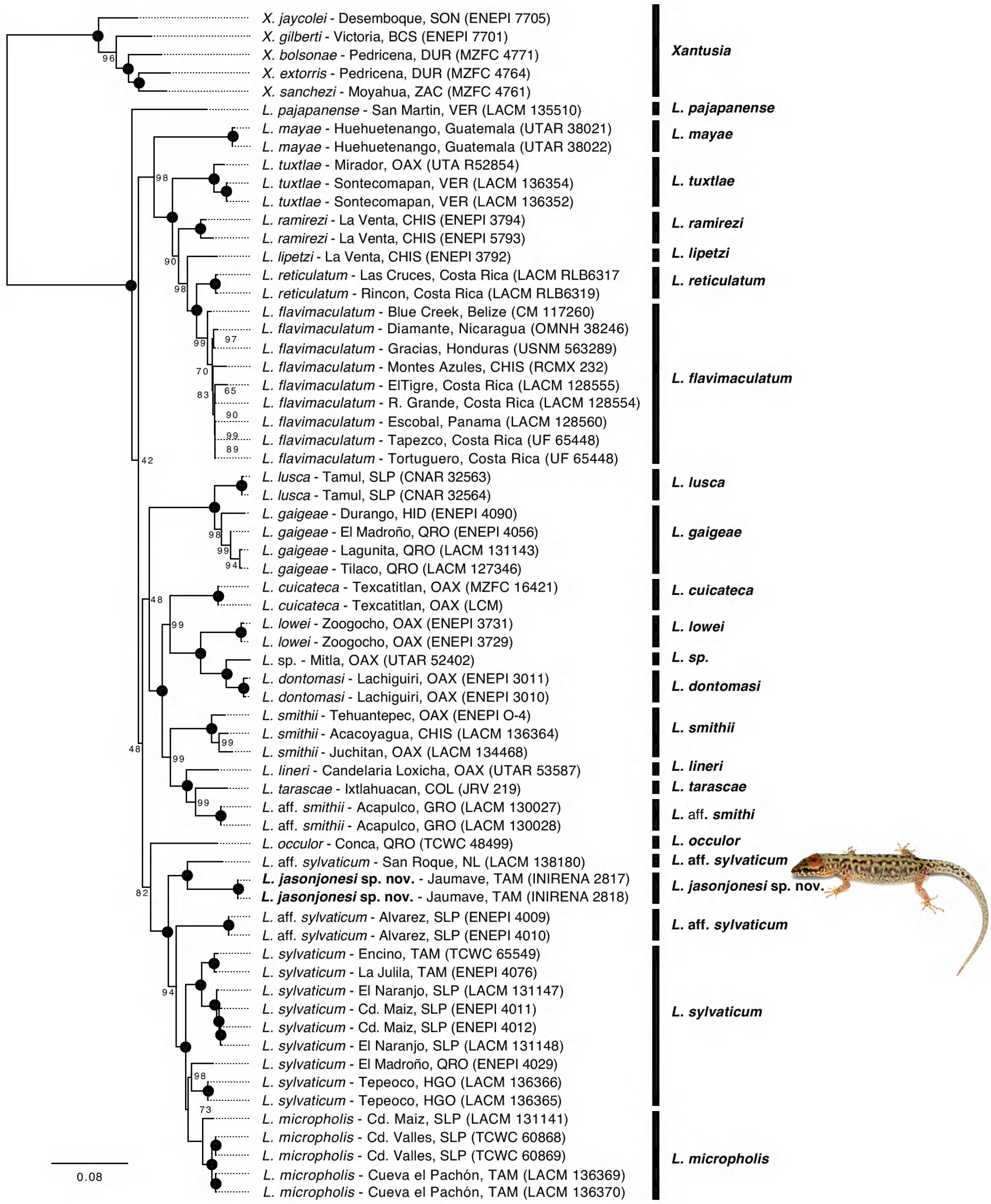

Figure 1. Maximum Likelihood phylogenetic inference of members of the Xantusiid genera *Lepidophyma* and *Xantusia*, based on four mitochondrial and seven nuclear loci. All nodes with bootstrap values equal to 100 are marked with a black dot.

(23.617489, -99.285573, 1,005 m a.s.l.; datum = WGS84) (Fig. 3), by Jason M. Jones and Ivan Ahumada-Carrillo on 26 July 2016.

Paratypes **(Fig. 4).** INIRENA 2818 (Original field number CIG-0970). Adult male, with the same collection data as the Holotype.

Diagnosis. *Lepidophyma jasonjonesi* sp. nov. can be distinguished from all its congeners by the following combination of characters: flattened head and body, head height 31–32% of head length; anterior pretympanic plate large, similar size as anterior supratemporal; 52–54 gular scales; 0–1 gular scales contacting first pair of infralabials;

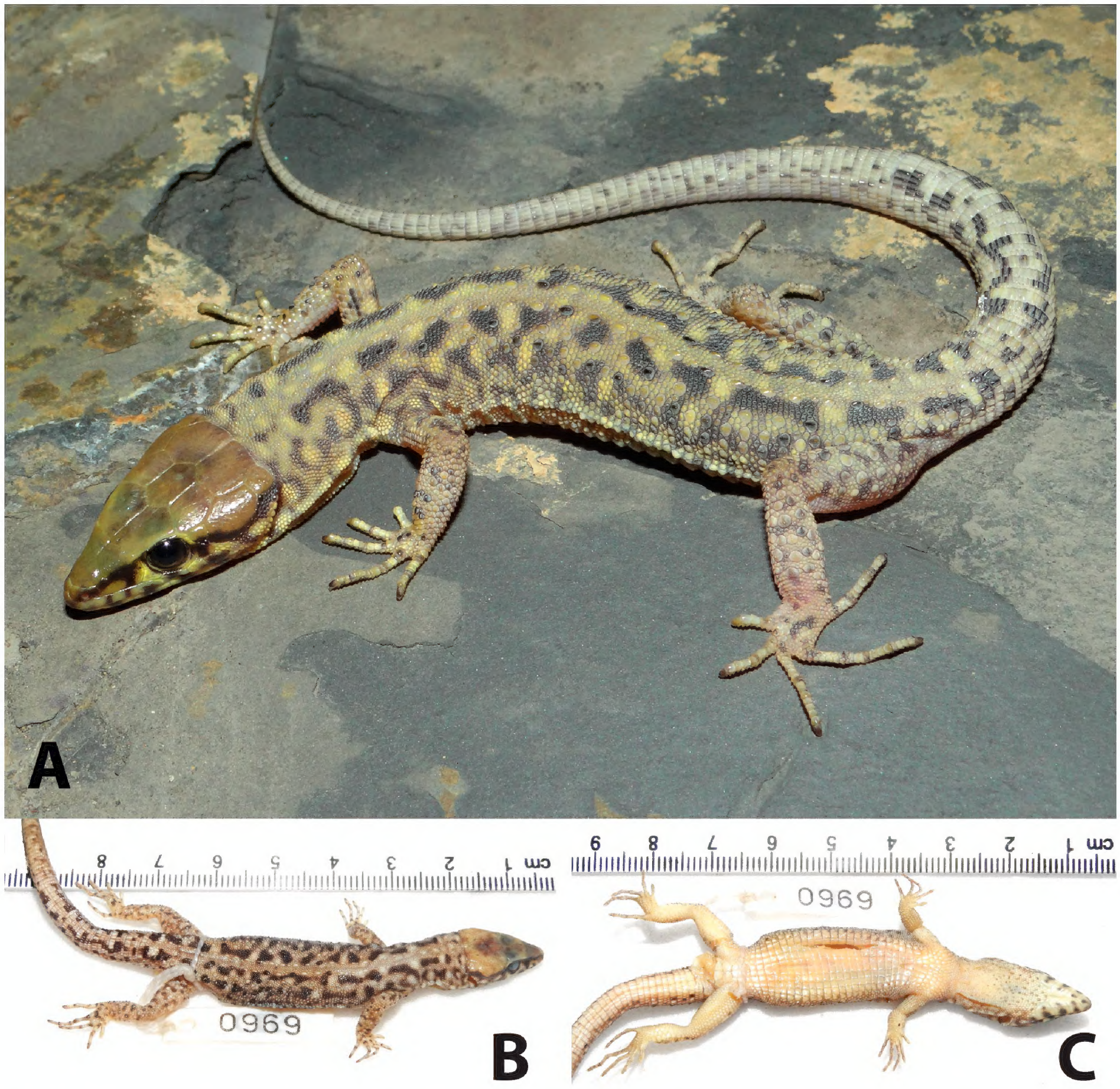

Figure 2. *Lepidophyma jasonjonesi* sp. nov. Holotype (INIRENA 2817). (**A**) Dorso-lateral perspective in life; (**B**) dorsal perspective in preservative; (**C**) ventral perspective in preservative.

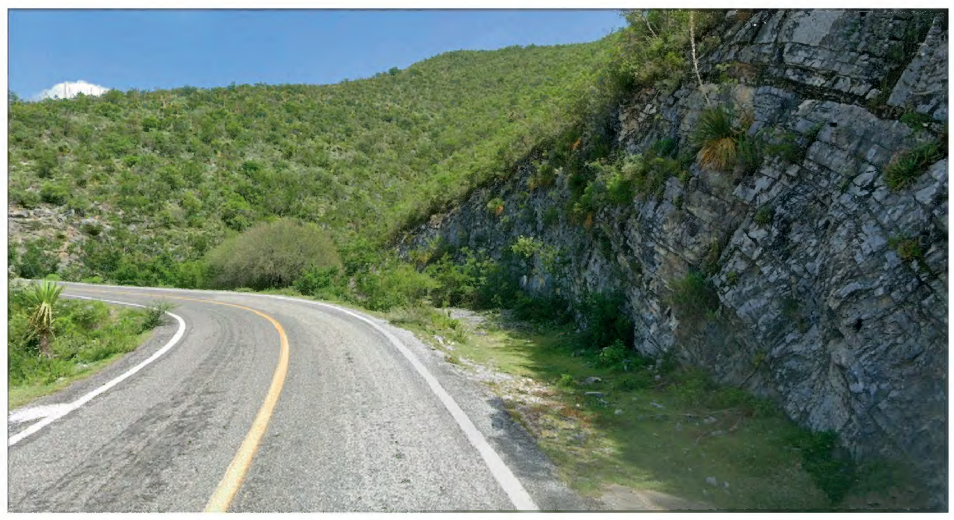

Figure 3. Photo of the locality and habitat at the type locality of *Lepidophyma jasonjonesi* sp. nov. (Photo from Google Earth).

180–182 dorsal scales mid-ventrally between occipitals and rump; 17–18 enlarged tubercles in paravertebral row between axilla and groin, 16 enlarged tubercles in second vertebral row between axilla and groin; 37–40 total femoral pores; 27–30 lamellae on fourth toe of foot, with 10–15 divided mid-ventrally; 35–38 ventral scale rows, with 10 longitudinal ventral scale rows; iris brown.

Comparisons. One of the most striking characteristics of this species which distinguish it amongst known *Lepidophyma* is the flattened head and body shape. While this character is not very evident from photos, it is evident when a specimen is in hand. We have included detailed photos of the head, including from a lateral profile (Fig. 5; Suppl. material 1: plate S1), which best portrays this unique flattening of the head. This species can be distinguished from most *Lepidophyma*, except *L. chicoasense*, *L. lipetzi*, *L. flavimaculatum*, *L. ramirezi* and *L. zongolica* by the high number (37–40) of total femoral pores, vs. 14–36 in the other species. It further differs from most species of *Lepidophyma*, except *L. smithii* and *L. tarascae*, by

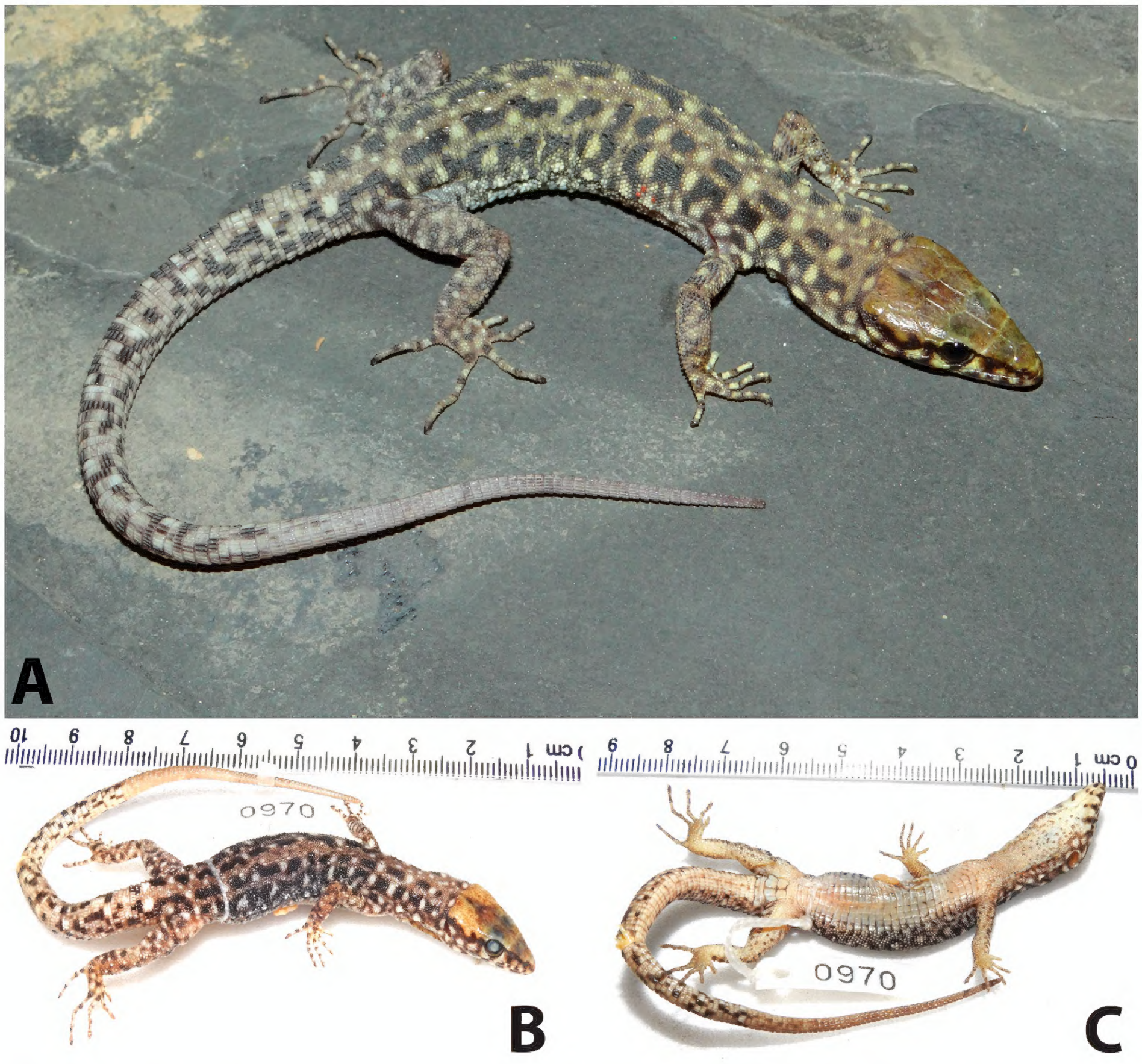

Figure 4. *Lepidophyma jasonjonesi* sp. nov. Paratype (INIRENA 2818). (**A**) Dorso-lateral perspective in life; (**B**) dorsal perspective in preservative; (**C**) ventral perspective in preservative.

possessing 16 lateral tubercle rows between the axilla and the groin, vs. 21–73 in the other species. It can be distinguished from members of the *L. gaigeae* group as defined by Bezy and Camarillo (1992, 2002), Canseco-Márquez et al. (2008) and Arenas-Moreno et al. (2021) by possessing enlarged tubercles interspersed amongst the small granular scales, including on the anterior and lateral portions of the body, vs. no enlarged tubercles in *L. cuicateca*, *L. dontomasi*, *L. gaigeae*, *L. lowei*, *L. lusca* and *L. radula*. *L. jasonjonesi* sp. nov. is most closely related to *L. sylvaticum* and *L. micropholis* (see results below). *L. jasonjonesi* sp. nov. differs from *L. micropholis* in the following manner (*L. micropholis* character states in parenthesis): a more flattened head and body build (vs. not flattened), HH/HL ratio of 0.31–0.32% (vs. 0.35–0.37), larger dorsal scales in 180–182 dorsal scale rows (vs. smaller dorsal scales in 231–251 dorsal scale rows), 37–40 femoral pores (vs. 28–36), 16 lateral rows of tubercles (vs. 27–35), 52–54 gulars (vs. 55–68).

L. jasonjonesi sp. nov. differs from *L. sylvaticum* in the following manner (*L. sylvaticum* character states in parenthesis): a more flattened head and body build (vs. not flattened), HH/HL ratio of 0.31–0.32 (vs. 0.41–0.45), tympanum with upper part tilted approximately 20° posteriorly, allowing for a more flattened head-shape (vs. tympanum not tilted posteriorly), lacking enlarged tubercles on the lateral portions of the body, giving a smooth appearance (vs. enlarged lateral tubercles present, rugose appearance), 37–40 femoral pores (vs. 24–36). *L. jasonjonesi* sp. nov. can be distinguished from arid-land populations assigned to *L. sylvaticum* by Bezy (1984) by possessing more 180–182 mid-dorsal scales (vs. 150–178), by possessing one pretympanic scale separating postocular from second postorbital supralabial (vs. 2–3), by possessing 52–54 gulars (vs. 42–49) and by possessing 17–18 enlarged tubercles in the paravertebral row (vs. 15–17). We include mensural ranges for the six key characters of all currently-recognised species of *Lepidophyma* for comparative purposes in Table 1.

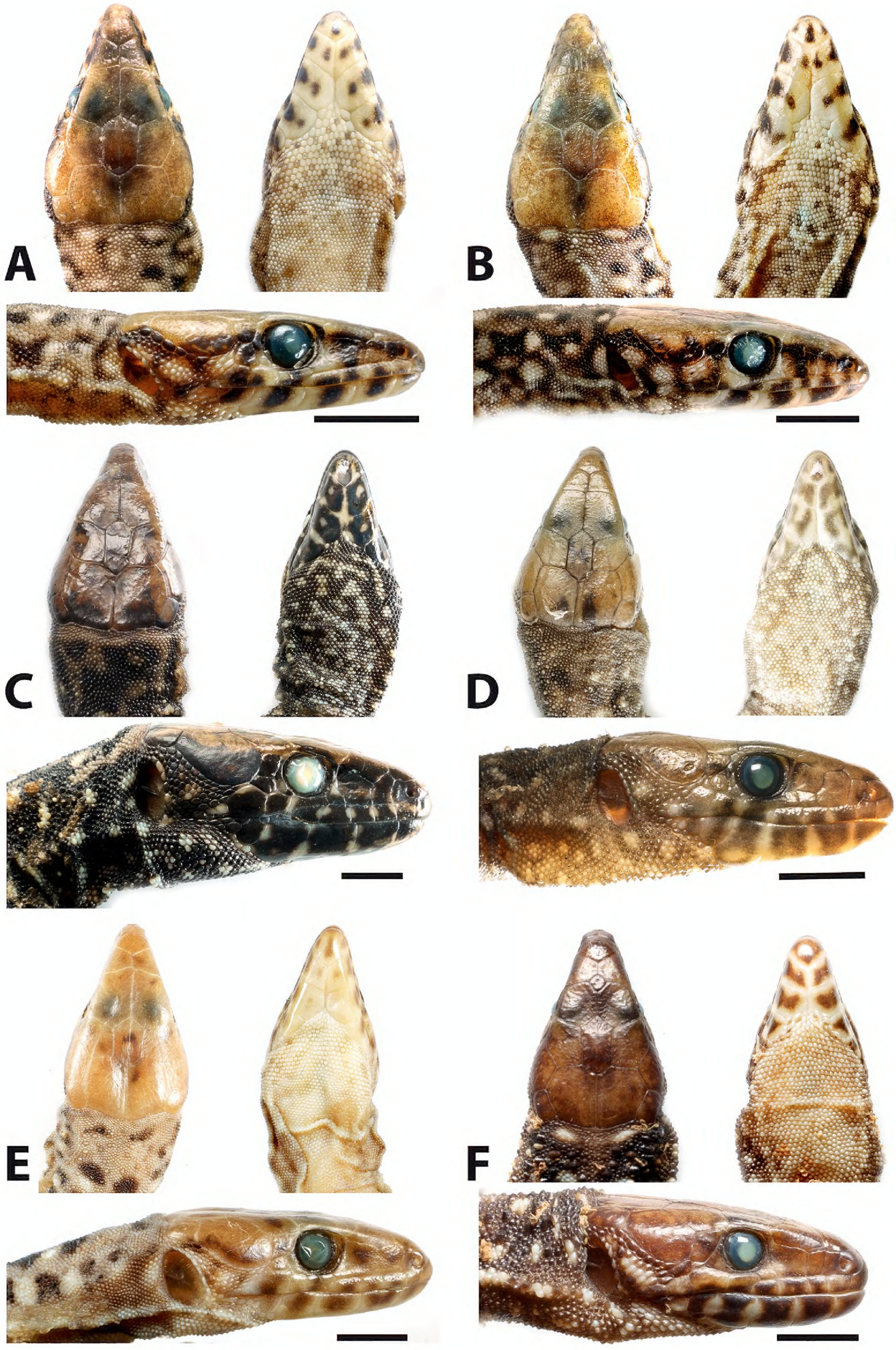

Figure 5. Comparison of head scalation of *Lepidophyma*. **A.** *Lepidophyma jasonjonesi* sp. nov. Holotype (INIRENA 2817); **B.** *Lepidophyma jasonjonesi* sp. nov. Paratype (INIRENA 2818); **C.** *Lepidophyma sylvaticum* (CIG 01550) Valle de Trinidad, Municipio de Xilitla, San Luis Potosí; **D.** *Lepidophyma sylvaticum* (CIG 01391) Loma Santa Rosita, Municipio de Yecuautla, Veracruz; **E.** *Lepidophyma micropholis* (CIG 00829) Grutas de Quintero, Municipio de El Mante, Tamaulipas; **F.** *Lepidophyma tarascae* (JRV 0239) Grutas San Gabriel, Municipio de Ixtlahuacán, Colima. The black line below each lateral profile represents 0.5 cm.

Table 1. Comparison of characteristic variation of *Lepidophyma jasonjonesi* sp. nov. to other species of *Lepidophyma*. Species are arranged by species group (*sensu* Bezy and Camarillo 2002), and *L. sylvaticum* data provided are only for humid environ populations (*sensu* Bezy 1984). This detail is noteworthy because what Bezy (1984) considered "*L. sylvaticum* Arid" we now know is composed of several taxa (see Discussion), and does not represent *L. sylvaticum* sensu stricto. Abbreviations used in the table are total femoral pores (FPT), lateral tubercle rows (LTR), gulars (GUL), dorsal scales along the mid-dorsal line between the post-parietals and a point above the vent (DOR), fourth toe lamellae (FTL) and paravertebral row (PVR).

Species	FPT	LTR	GUL	DOR	FTL	PVR
L .jasonjonesi sp. nov.	37–40	16	52–54	180–182	27–30	68–71
L. micropholis	28–36	27–35	55–72	230–251	24–29	52–85
L. occulor	17–22	22–25	58–71	213–242	22–25	49–69
L. sylvaticum	24–35	24–38	41–56	166–207	23–31	40–73
L. chicoasense	33–38	31–32	53–56	177–192	35–37	57–70
L. lipetzi	35–38	32–33	46–52	177–179	27–28	59–60
L. flavimaculatum	25–43	23–33	40–55	170–225	23–31	41–74
L. mayae	29–35	33–46	38–44	162–188	23–28	41–57
L. pajapanense	30–36	36–43	35–43	152–175	26–30	37–49
L. ramirezi	35–42	25–30	47–54	177–226	25–31	–
L. reticulatum	27–33	28–33	44–54	193–229	26–31	52–72
L. tuxtlae	18–29	30–40	37–52	150–190	22–29	37–55
L. zongolica	33–43	21–28	40–49	174–184	27–30	61–66
L. cuicateca	26	33–37	36–39	150–168	18–19	54–62
L. dontomasi	17–21	47–60	28–35	128–149	18–22	43–61
L. gaigeae	28–29	39–73	28–44	121–151	22–30	30–74
L. lowei	22–31	28–31	32–37	158–170	19–23	45–60
L. lusca	18–26	21–34	27–38	118–132	24–29	55–64
L. radula	20	24	32	135	20	46
L. inagoi	20–24	25–27	58–63	190–215	20–26	71–91
L. lineri	16–17	23–24	51–52	179–184	23–25	43–53
L. smithii	15–30	15–22	44–59	162–224	20–29	35–69
L. tarascae	14–18	16–25	40–43	145–159	22–23	42–49

Description of the holotype (Fig. 2). An adult male, with a rostral broader than high (2.2 mm broad, 1.15 mm high), followed by nasals which are in contact with median frontonasal; two prefrontals; two frontoparietals; no frontal; interparietal scale without parietal spot, but with parietal organ slightly visible and two parietals on the sides. Interparietal scale in contact with supraoculars, parietals and occipitals. Naris bordered by frontonasal, postnasal and first supralabial. Followed by two loreal scales, anterior loreal scale taller than postnasal and posterior loreal scale largest. Eight supralabials on both sides, fifth touching eye, sixth sub-square on left (1.3 tall long, 1.1 mm tall) and rectangular on right (1.6 mm long, 1.1 mm tall) and largest supralabial on both sides is seventh, rectangular in shape and on left 1.6 mm long, 1.1 mm tall and on right 1.8 mm long, 1.1 mm tall. Lower elongated postocular in contact with sixth supralabial on both sides.

Three supratemporal scales, first supratemporal scale in contact with parietal, second supratemporal scale is largest and in contact with parietal and occipital and third supratemporal in contact with occipital. The second supratemporal scale (3.8 mm long, 2.7 mm tall) is larger than the parietal (3.0 mm long, 2.8 mm wide). One large pretympanic scale between postoculars and seventh supralabial on both sides, with a reduced number of scales in temporal region, on left side, one large pretympanic scale and two small scales between anterior temporal and sixth and seventh supralabial, on right side only one large pretympanic scale between anterior temporal and sixth and seventh supralabials. The enlarged pretympanic scale (1.1 mm long, 1.0 mm tall) is subequal to the anterior temporal scale (1.2 mm long, 1.1 mm tall). Seven enlarged auricular scales bordering anterior portion of auricular opening, upper one dark and lower seven pale. Mental broader than long (2.7 mm broad, 2.3 mm long), follow by five pairs infralabials on both sides, the second and third are largest and the fifth is very reduced. Orbit in contact with one elongate preocular, fifth supralabial, two elongated postoculars and supraocular. No gulars contacting first pair of infralabials; 52 gulars along the ventral mid-line between second pair of infralabials and posterior gular fold.

The dorsal and lateral surfaces of the body covered by small granular scales of varying sizes, interspaced with enlarged tubercles, some of which are weakly keeled and some smooth (approximately three times the size of adjacent dorsal scales). Eighteen enlarged paravertebral tubercles from above axilla to above groin in the paravertebral row. One hundred and eighty dorsal scales along the vertebral line from the posterior edge of the occipitals to above the vent.

Square ventral scales are smooth and flat, in 10 longitudinal rows at mid-body; the lateral rows slightly smaller and keeled. Thirty-five transverse rows of ventral scales between gular fold and vent, including the anterior and posterior pre-anal scales. Scales on ventral surface of limbs heterogeneous in size, 37 total femoral pores (20 / 17). Twenty-nine sub-digital lamellae on fourth toe of left foot, 27 on fourth toe of right foot.

Regenerated tail approximately 80 mm long, regenerated at 25 mm from base. The unregenerated part with complete enlarged whorls, each separated by three rows of interwhorls; on ventral portion of tail these rows reduce to two.

Colouration in life (Figs 2, 3). Dorsal colouration of head chocolate brown; with a greenish tinge on the frontonasals, prefrontals and frontoparietals; interparietal, occipitals and supratemporals chocolate brown. Upper labials yellow, with a dark brown irregular loreal stripe which runs from the tip of the snout to the lower posterior edge of the occipitals. Dark loreal stripe chocolate brown and extends down on to third supralabial. Dorsal ground colouration of dorsum yellowish-cream, with unmarked pale yellowish-cream stripe down mid-dorsal region. Black reticulation on lateral portions of dorsum and flanks, with pale yellow highlights forming indistinct occelli. Tail pale grey with black blotches. Ventral colouration of head yellowish-cream, with brown spots. Venter white, with grey spots on throat and tail. Iris brass-copper coloured.

Colouration in preservative. After several years in preservative, the dorsal colouration of the head light tan, with green tinge faded away. Dark melanophores spread evenly on all large head scales. Labial region

yellowish-cream ground colouration with one dark brown blotch on each supralabial, centred on the anterior five supralabials, concentrated on the posterior portion of the sixth supralabials and covering the most of the seventh and eight supralabials. Dark brown loreal lateral stripe on head begins anterior to naris, proceeds posteriorly through loreal region, where it extends down on to third supralabial and then posterior through upper orbit and posteriorly through the supratemporal scales to above the tympanum. The dorsal colouration of the body is pale tan, with two broken rows of dark brown blotches dorso-laterally and then dark brown spotting and reticulation. The mid-dorsal area, between the two paravertebral tubercle rows, is pale tan and complete unmarked. Two rows of pale cream ocelli are present between the rows of dark brown blotches, with 10–11 pale ocelli present per row. Dorsal colouration of tail pale cream with remnants of dark brown blotches turning into two alternating rows of dark brown spots. Tail is regenerated after proximal third and the regenerated portion lacks dark brown spots. Ventral colouration yellowish-cream. Ventral surface of head and throat yellowish-cream, with dark spotting. Three dark brown blotches on postmental, which are composed of dense clusters of little dark brown spots. These dark brown blotches continue on to the infralabials, where they are arranged in subequal pairs, the larger one nearest to the mouth. The throat has approximately 50 brown spots which consist of one gular each and extend back to the thirtieth row of gulars. The latter portion of the throat unmarked, cream. Venter unmarked, cream, lateral two rows of ventral scales haves some dark black stippling along the scale edges, most concentrated towards the anterior portion of the scale. Ventral portions of arms, hands, thighs, legs and feet are cream, unmarked. Ventral surface of tail white, unmarked. Eye black.

Measurements (mm). SVL 61.0 mm; TL 79.8 mm; TotL; 140.8 HL 15.1 mm; HW 9.65 mm; HH 4.7 mm; ED 2.4 mm; 4TL 7.7 mm.

Variation. Meristic variation of the two available specimens is given in Table 2. The paratype (INIRENA 2818) possesses a pale spot on the interparietal scale, towards the posterior portion of the scale and roughly encompassing the parietal organ. The paratype has 17 enlarged paravertebral tubercles in the paravertebral row between the axilla and the groin, as well as a total of 40 femoral pores. We have depicted variation of colour pattern of other individuals which were photographed (but not collected) at the type locality (Fig. 6). The dorsal colouration and pattern of all the individuals observed is the same; however, each individual varies slightly by amount and shape of the dark dorsal blotches and pale yellow dorsal ocelli.

Distribution and habitat. This species is known from semi-arid tropical deciduous forest on the lower leeward slopes of the Sierra Madre Oriental between Ciudad Victoria and Jaumave, Tamaulipas. The vegetation of the tropical deciduous forest in the Jaumave Valley grows to a low height and was described as "thorn desert" (= thornscrub) by Martin (1958). Martin reported 568 mm of mean annual precipitation and a mean annual temperature of 21.2 °C for Jaumave. The Koppen classification for the valley is BSh (hot semi-arid climate). The Jaumave Valley is unique for its Cactacea biodiversity and endemism (Martin 1958). *Lepidophyma jasonjonesi* sp. nov. is known with certainty only from 1005 m elev. at the type locality (Fig. 3), where it has been observed on several occasions. Sight records of small saxicolous *Lepidophyma* at other points along this stretch of highway and near it are likely to be of this species and we have included one of these on the distribution map (Fig. 7). A specimen from Gomez Farías, Tamaulipas (CIG 2050) appears to represent this species; however, we have decided not to include it as a paratype pending further molecular work. A population of *Lepidophyma* from San Roque (Nuevo León) is closely related, but whether it represent this species remains unresolved (see below, Fig. 8).

Etymology. Named in honour of Jason Michael Jones, American-Mexican herpetologist and savvy field collector, who has always shared a profound interest for members of the family Xantusiidae and who collected the type series of the new species.

Table 2. Meristic variation of *Lepidophyma jasonjonesi* sp. nov. All measurements in mm.

Species	*L. jasonjonesi* sp. nov.	*L. jasonjonesi* sp. nov.
Specimen	**INIRENA 2817**	**INIRENA 2818**
Sex	Male	Male
Snout-vent Length	61.0	62.0
Tail Length	80.0	91.0
Total Length	141.0	153.0
Head Length (HL)	15.1	15.5
Head Width (HW)	9.7	9.5
Head Height (HH)	4.7	5.0
Fourth Toe Length (4TL)	7.7	8.6
Eye Diameter (ED)	2.4	2.4
HH/HL	0.31	0.32
HH/HW	0.49	0.53
Pretympanics	1 / 1	1 / 1
Gulars	52	54
Gulars contacting 1st Infralabials	0	1
Dorsals	180	182
Dorsals between Paravertebral Rows	4	5
Large Paravertebral Tubercles	18	17
Paravertebral Row	68	71
Lateral Tubercle Rows	16	16
Dorsal Interwhorls	3	3
Ventral Interwhorls	2	2
Ventrals, Longitudinal	35	38
Ventrals, Across	10	10
Femoral Pores	20 /17	20 / 20
Fourth Toe Lamellae	29 / 27	30 / 29
Divided Fourth Toe Lamellae	12 / 10	15 / 14
Parietal Spot	Absent	Present
Left 6th Supralabial Measurement (L / H)	1.3 x 1.1	0.9 x 1.0
Left 7th Supralabial Measurement (L / H)	1.6 x 1.1	2.1 x 1.1
Right 6th Supralabial Measurement (L / H)	1.6 x 1.1	1.3 x 1.0
Right 7th Supralabial Measurement (L / H)	1.8 x 1.1	1.5 x 1.2

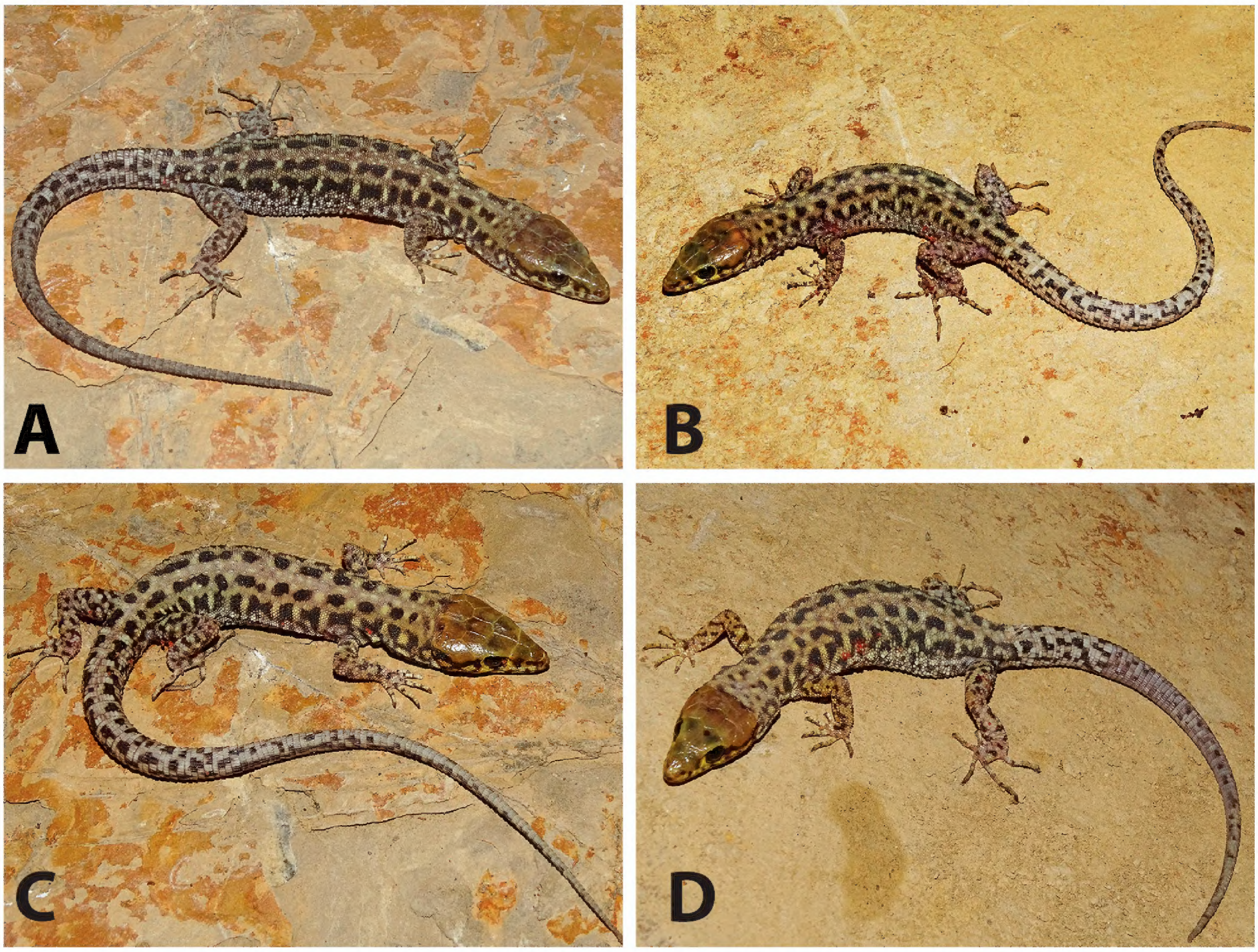

Figure 6. (**A–D**) Variation of *Lepidophyma jasonjonesi* sp. nov. individuals seen at the type locality. All photographs by Jason M. Jones, taken in October, 2016.

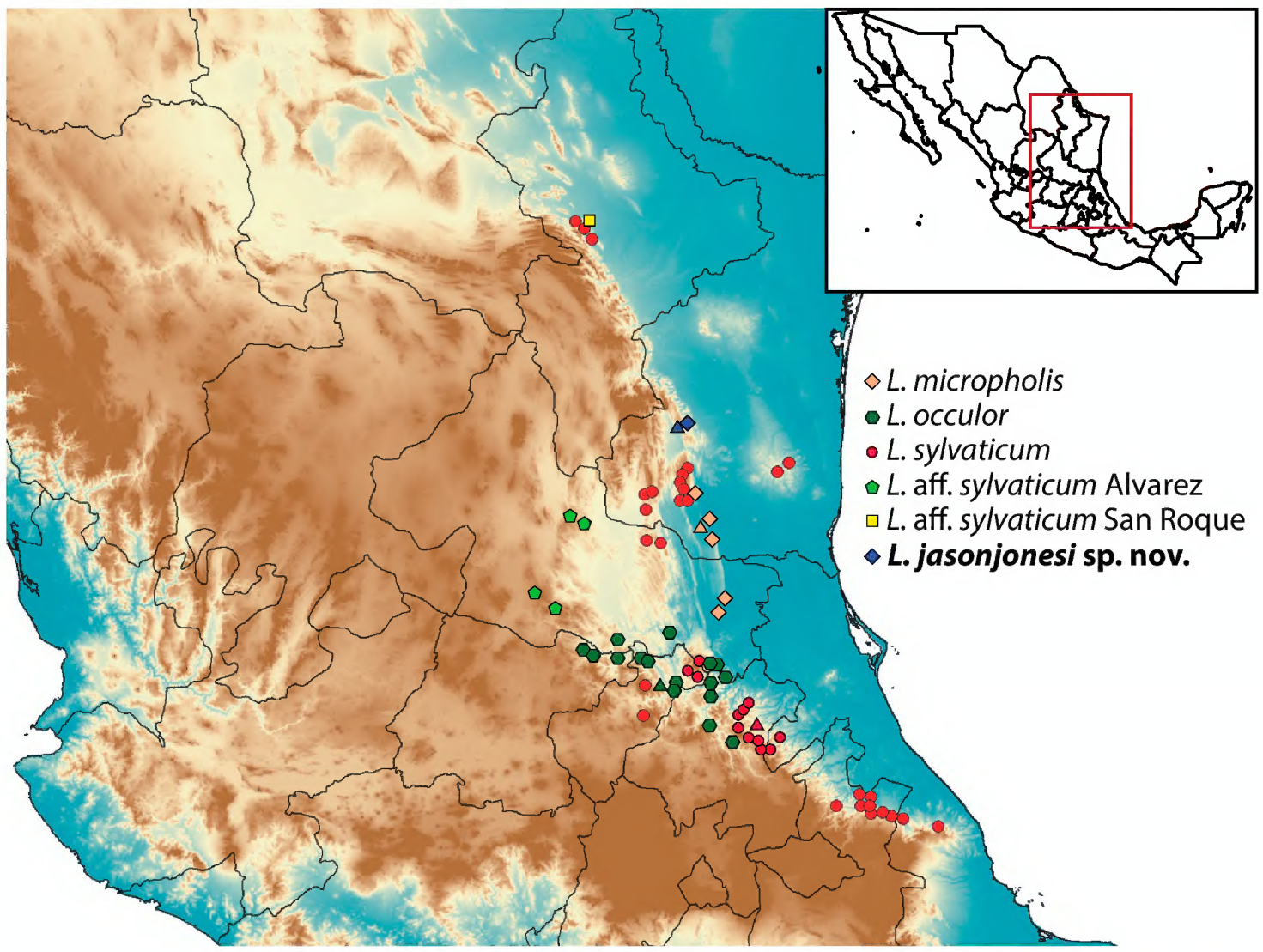

Figure 7. Distribution map of species in the *Lepidophyma sylvaticum* species group in north-eastern Mexico. Triangles represent type localities. Inset represents the paratype *L. jasonjonesi* sp. nov. (INIRENA 2818). See Materials and Methods for source of records.

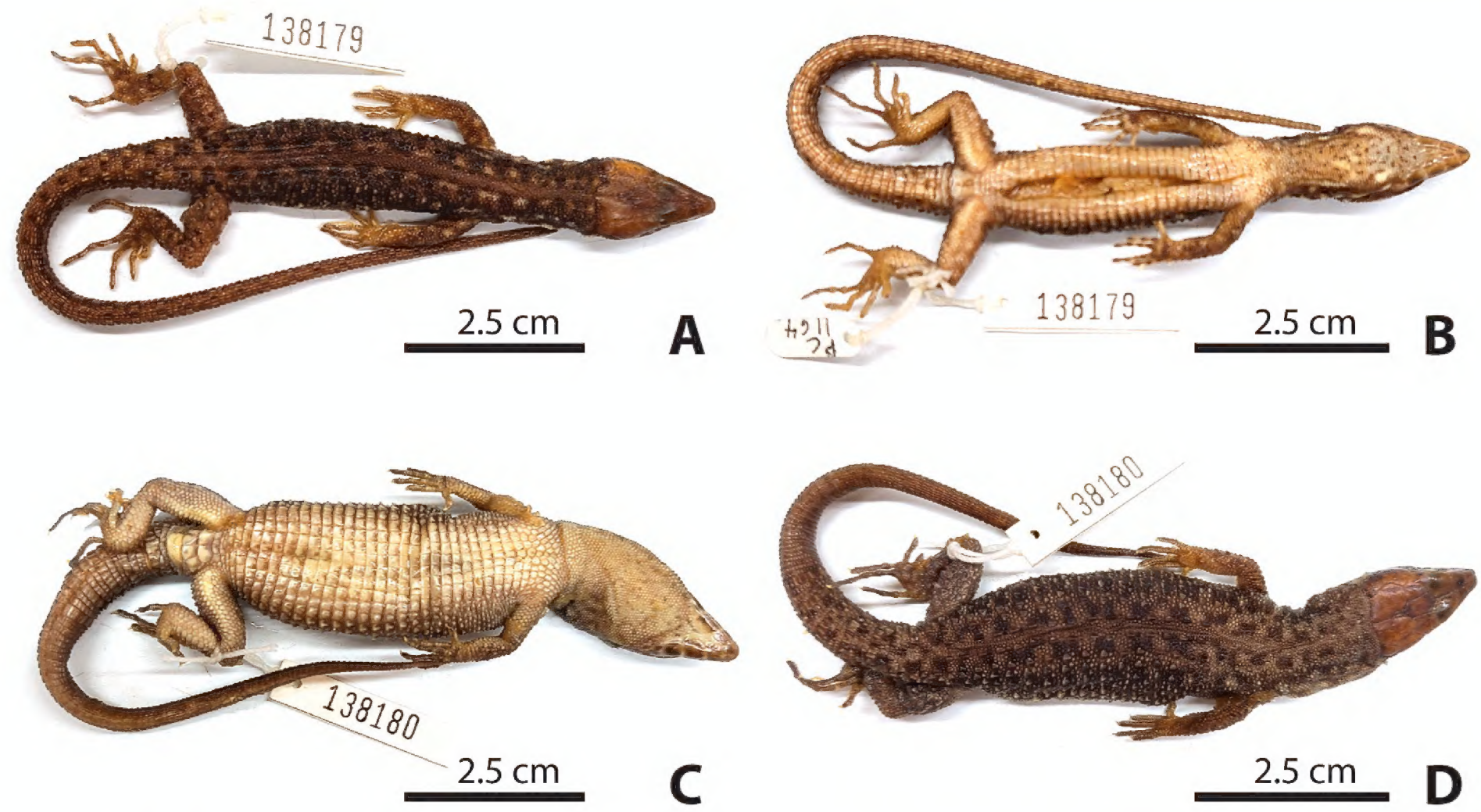

Figure 8. Photos of preserved specimens of a closely related species of *Lepidophyma* from San Roque, Municipio de Juárez, Nuevo León, Mexico. LACM 138179 (**A, B**); LACM 138180 (**C, D**).

Discussion

Additional taxa of the genus *Lepidophyma* continue to be discovered in Mexico. The majority of these new taxa have been described from the Sierra Madre Oriental and Sierra Madre del Sur and appear to be micro endemic. Our new species also appears to be rescripted to a small portion of the Sierra Madre Oriental; however, this apparent small range might be the result of poor sampling in the region and its distribution might be much larger than currently known (Fig. 7).

Our phylogenetic analysis shows that *L. jasonjonesi* sp. nov. is part of the *L. sylvaticum* group, which is restricted to north-eastern Mexico. Our results, alongside those of Noonan et al. (2013), show that the taxonomy of this group is in need of revision. The *L. sylvaticum* group appears to consist of at least five different taxa (Fig. 1), of which at least one is undescribed. These are *L. occulor*, *L. jasonjonesi* sp. nov., *L.* aff. *sylvaticum* Alvarez, *L. sylvaticum* and *L. micropholis*.

Individuals of *Lepidophyma* from central San Luis Potosí (*L.* aff. *sylvaticum* Alvarez) are the sister taxa to the remaining *L. sylvaticum* + *L. micropholis* (Fig. 1) and might require species recognition. The remaining populations of *L. sylvaticum* are represented by two distinct populations, one composed by individuals from eastern San Luis Potosí and Tamaulipas, while individuals from Querétaro and Hidalgo are sister to *L. micropholis*. Based on our results, we suggest additional studies are required to establish if the multiple populations of *L. sylvaticum* should be elevated to species and whether *L. micropholis* should be synonymised with *L. sylvaticum*.

The population of *Lepidophyma* from San Roque, Nuevo León (Fig. 8) requires additional study. Our molecular analysis shows that it is sister to *L. jasonjonesi* sp. nov. and it is likely that it represents a second population of this species. However, this population could also represent a second new species in the group, closely related to *L. jasonjonesi* sp. nov. As we do not have specimens of this population available for morphological study, we exclude them from our species description. Further specimens must be collected to properly resolve the status of this population. Two individuals of this population (LACM 138179, 138180; Fig. 8) show that they share a general resemblance to *L. jasonjonesi* sp. nov. and might share a similar saxicolous lifestyle. According to Noonan et al. (2013), a rock-crevice dwelling ecomorphotype (such as flattened body shape and smooth dorsal body scales lacking enlarged tubercles) evolved independently in *Lepidophyma* at least two times. Our data suggest that this rock-crevice dwelling ecomorphotype evolved independently as well within the *L. sylvaticum* group.

As stated above, one of the most striking characteristics of *Lepidophyma jasonjonesi* sp. nov. is the flattened head and body shape. This characteristic is reminiscent of the African *Platysaurus*, as well as the relatively closely related saxicolous *Xantusia* (*X. bezyi*, *X. bolsonae*, *X. henshawi*), but not seen to this degree in *Lepidophyma*. Upon first seeing the *L. jasonjonesi* sp. nov. specimens after preservation, two of authors (CIG, JRV) thought the flattened nature of the specimens was product of poor preservation or too much pressure being applied during preservation. However, live individuals are equally flat.

Conservation

Lepidophyma jasonjonesi sp. nov. is known only from south-western Tamaulipas, around the vicinity of the type locality. Due to its small distribution, we recommend that this species should be rewarded the highest level of protection possible from the Mexican government. It currently classifies as DD (Data Deficient) category as designated by the IUCN criterion.

Acknowledgements

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Appendix 1

Specimens examined:

Lepidophyma cuicateca: MEXICO: Oaxaca: Texcaltitlán (MZFC 16421).
Lepidophyma dontomasi: MEXICO: Oaxaca: Lachiguiri (ENEPI 3011, 3013).
Lepidophyma aff. flavimaculatum: MEXICO: Chiapas: La Venta (ENEPI 3794, 5793).
Lepiodphyma flavimaculatum: BELIZE: Blue Creek (CM 117260); COSTA RICA: Suerte (LACM 131068); Tortuguero (UF 65448); MEXICO: Chiapas: Montes Azules (RCMX 212–13, 232); HONDURAS: Gracias a Dios (USNM 563289–90); NICARAGUA: Diamante (OMNH 38246–47); PANAMA: Escobal (LACM 128560–61).
Lepidophyma gaigeae: MEXICO: Hidalgo: Durango (ENEPI 4090, 4095); Querétaro: El Madroño (ENEPI 4055); Lagunitas (LACM 127420). Tilaco (LACM 127346).
Lepidophyma jasonjonesi sp. nov.: MEXICO: Tamaulipas: 28 km NNE of Jaumave Federal Highway 101 to Ciudad Victoria, Municipio de Victoria (INIRENA 2817–18).
Lepidophyma lineri: MEXICO: Oaxaca: Portillo del Rayo, Candelaria Loxicha (JAC 242260); San Pedro Mixtepec (CIG 1903).
Lepidophyma lowei: MEXICO: Oaxaca: Zoogocho, 4 km SE of San Bartolome Zoogocho (CNAR 7498–99).
Lepidophyma lusca: MEXICO: San Luis Potosí: Tamul. (CNAR 32563–64).
Lepidophyma micropholis: MEXICO: San Luis Potosí: west of Ciudad Maíz (LACM 131141); Tamaulipas: Pachón Cave (JAC 24541); Gruta Quintero (CIG 0829).
Lepidophyma occulor: MEXICO: Querétaro: ex-Hacienda La Conca (TCWC 48499, CIG 1763).
Lepidophyma pajapanense: MEXICO: Veracruz: San Martín Tuxtla (LACM 135510); Catemaco, abandoned hotel above Playa Escondida (CIG 2084–85).
Lepidophyma aff. *radula*: MEXICO: Oaxaca: Mitla-Ayutla Highway (UTA 52402).
Lepidophyma reticulatum: COSTA RICA: Las Cruces (RLB 6317–18); Rincón (RLB 6319–20).
Lepidophyma aff. *smithii*: MEXICO: Guerrero: Puerto Márquez (LACM 130027–28).
Lepidophyma smithii: MEXICO: Chiapas: Acacoyagua (LACM 136363–64); Tuzantan (JAC 23062); Oaxaca: Juchitán (LACM 134468–69); Tehuantepec (LACM 128589); Chimalapas (JAC 23150, 23166), Tehuantepec (ENEPI O_4).
Lepidophyma sp.: MEXICO: Nuevo León: San Roque (LACM 138179–80).
Lepidophyma aff. *sylvaticum*: MEXICO: San Luis Potosí: Álvarez (ENEPI 4009–10).
Lepidophyma sylvaticum: MEXICO: Hidalgo: El Madroño (ENEPI 4029); Tepeoco (LACM 136365–66); Querétaro: Pinal de Amoles (CIG 1764); San Luis Potosí: El Naranjo (LACM 131147–48); west of Ciudad Maíz (ENEPI 4011–12), Valle de Trinidad (CIG 1550–51); Tamaulipas: Encino (TCWC 65549); Julilo (La Julila?) ENEPI 4076); Veracruz: Yecuautla (CIG 1391).
Lepidophyma tarascae: MEXICO: Colima: Grutas de San Gabriel (JRV 0219);
Lepidophyma tuxtlae: MEXICO: Oaxaca: Mirador (JAC 22720); VERACRUZ: San Andrés Tuxtla, above Estación Biologica UNAM (CIG 2087–88); Los Tuxtlas (ENS 10352); San Andrés Tuxtla (JAC 22619, 22626); Sontecomapan (LACM 136352, 136354).
Lepidophyma zongolica: MEXICO: Puebla: Tepeyac, Eloxochitlán (MZFC 22183–86).

Supplementary material 1

High resolution PDF file of comparative head shots

Authors: Jacobo Reyes-Velasco
Data type: PDF / image
Explanation note: (A) *Lepidophyma jasonjonesi* sp. nov. Holotype (INIRENA 2817); (B) *Lepidophyma jasonjonesi* sp. nov. Paratype (INIRENA 2818). (C) *Lepidophyma sylvaticum* (CIG 01550) Valle de Trinidad, Municipio de Xilitla, San Luis Potosí. (D) *Lepidophyma sylvaticum* (CIG 01391) Loma Santa Rosita, Municipio de Yecuautla, Veracruz. (E) *Lepidophyma micropholis* (CIG 00829) Grutas de Quintero, Municipio de El Mante, Tamaulipas. (F) *Lepidophyma tarascae* (JRV 0239) Grutas San Gabriel, Municipio de Ixtlahuacán, Colima.
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Link: https://doi.org/10.3897/herpetozoa.36.e96184.suppl1

Supplementary material 2

Genbank sequences

Authors: Jacobo Reyes-Velasco
Data type: Spreadsheet
Explanation note: GenBank Numbers of sequences used in this study. New sequences are indicated in bold.
Copyright notice: This dataset is made available under the Open Database License (http://opendatacommons.org/licenses/odbl/1.0/). The Open Database License (ODbL) is a license agreement intended to allow users to freely share, modify, and use this Dataset while maintaining this same freedom for others, provided that the original source and author(s) are credited.
Link: https://doi.org/10.3897/herpetozoa.36.e96184.suppl2